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A LABORATORY METHOD FOR REARING *BONNETIA COMTA* FALLÉN (DIPTERA: TACHINIDAE)[1]

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Bonnetia comta Fallén (Diptera: Tachinidae) is a parasite of several noctuid larvae, including the black cutworm, *Agrotis ipsilon* (Hufnagel) (Arnaud, 1978). *B. comta* is among the most frequently reared parasites of the black cutworm in Ohio (Levine and Clement, unpub. data). Because *A. ipsilon* is an important pest of corn in the Corn Belt, we wished to conduct laboratory studies to determine the effect of parasitism by *B. comta* on larval longevity and damage potential of black cutworms.

Although Strickland (1923), Allen (1926), and Wen et al. (1965) studied the relationship of *B. comta* with lepidopterous hosts, they did not describe methods for rearing this parasitic fly. In this paper we describe methods for rearing sufficient numbers of *B. comta* to conduct small-scale laboratory studies involving this parasite and the black cutworm. We also provide new information on developmental interactions between *B. comta* and *A. ipsilon*.

Rearing Methods

Flies were obtained in June 1978 from a large number of 4th–6th instar black cutworms collected in a Wayne County, Ohio cornfield. These host larvae were reared individually in 35 ml capped plastic cups on a pinto bean diet (Nielsen et al., 1979) at 27 ± 1°C, 60 ± 10% RH, and 16 hr photoperiod. Flies that emerged from these larvae were transferred to 38 × 39 × 39-cm plexiglass and plastic mesh cages, 10–20 flies per cage. The sex ratio of these flies was not determined; however, the ♀:♂ sex ratio of 148 flies from several cages was 1.1:1. The cages were provided with two 60 ml cups, one containing cotton soaked with water, the other containing cotton soaked with 25% honey solution. Female flies were induced to larviposit by providing each cage with fresh (<24 hr old) black cutworm fecal pellets in open petri dishes lined with filter paper. Feces (provided daily) were obtained from 5th–6th instars fed pinto bean diet. We observed females larviposit on or within 5 mm of a fecal pellet.

We were able to establish a laboratory colony of the fly once larviposition had begun. Parasitization of black cutworms (5th–6th instars) was accomplished by transferring maggots (=planidia) with a dissecting probe (one per

Table 1. Larviposition response of *Bonnetia comta* to feces and vomitus from the black cutworm.

Test materials	Mean no. of planidia[1]		
	Cage 1	Cage 2	Cage 3
Feces	116.3 a[2]	68.0 a	58.0 a
Vomitus	17.3 b	7.8 b	17.0 b
Control	6.0 b	0.5 c	2.0 c

[1] Values based on 4 replicates/treatment/cage.

[2] Numbers in each column followed by the same letter are not significantly different ($P < 0.05$) (DNMRT).

host) to the upper abdominal surface of larvae. With this technique it was not necessary to remove larvae from their 35 ml diet cups. Parasitized larvae were reared under the aforementioned conditions. Host larvae and feces were obtained from a black cutworm colony maintained at the Ohio Agricultural Research and Development Center.

Although the above rearing method proved to be satisfactory we did modify it in January 1980 by reducing the number of flies per larviposition cage to 2 or 4 (1:1 sex ratio). Males can be sexed by their pulvilli which are more elongate than females. Flies were observed to mate freely in cages containing either 10–20 or 2–4 flies.

To determine if larviposition is triggered by a substance produced by black cutworm larvae, a laboratory bioassay was conducted as follows. We placed a male and female fly in each of 3 cages shortly after their emergence from puparia. Then each cage was supplied with water and honey solution as previously described and placed in a rearing room (24 ± 1°C, 80 ± 5% RH, and a 16 hr photoperiod). Test materials on filter paper in petri dishes were introduced into each cage 7 days after fly eclosion since females started to larviposit about that time. The petri dishes (4 replicates/treatment) were arranged in a randomized complete block design. Larviposition was recorded, test materials were replaced, and petri dishes were re-randomized 2–3 times per cage during the length of the test period (48–96 hr). Test materials, which were obtained from 6th instars fed pinto bean diet, included fresh fecal pellets (one pellet/petri dish) and vomitus (one small drop/petri dish). Controls consisted of empty petri dishes.

Table 1 shows that significantly more ($P < 0.05$) planidia were deposited in petri dishes with feces. Vomitus elicited a statistically stronger ($P < 0.05$) larviposition response than did empty petri dishes in 2 cages. These results suggest that a substance (kairomone) in the feces, and perhaps in the vomitus, stimulates *B. comta* to larviposit.

Interestingly, Wen et al. (1965) stated that *B. comta* larviposited on soil surfaces over which *A. ipsilon* moved, as well as on plant surfaces where

this host fed. In contrast, Strickland (1923) and Allen (1926) reported that *B. comta* larviposited freely on foliage in the absence of host caterpillars but these observations are not surprising since some tachinids may larviposit in the absence of a larvipositional stimulant, apparently because of the pressure of eggs in the uterus (see Clausen, 1940). In fact, we observed a few females larvipositing in cages lacking the larvipositional stimulant. However, it is clear that knowledge of the stimulus influencing the ovipositional behavior of *B. comta* has been important in maintaining our laboratory colony of this parasite.

We have maintained a laboratory colony of *B. comta* since June 1978. Feral flies were introduced into the colony in July 1979.

Parasite Development

Planidia entered hosts by boring through segmental membranes, activity which usually took <5 min. Duration of the endoparasitic period varied significantly with the host's stage of development at which parasitization occurred. The average duration of this period within hosts parasitized as 3rd, 4th, 5th, and 6th instars was 14.2a (n = 18), 10.9b (n = 18), 8.8c (n = 12), and 9.7c (n = 9) days, respectively (means followed by the same letter are not significantly different, $P < 0.05$). Thus, maggot development was generally accelerated with advance in host larval stage parasitized.

Parasite pupation occurred within 6 hr after fully developed maggots emerged from host larvae. The pupal period was significantly ($P < 0.01$) longer for parasites reared from larvae parasitized as 6th instars (11.2 ± 0.2 days, n = 9, $\bar{x}$ ± SE) than for those reared from larvae parasitized as 3rd instars (10.5 ± 0.1 days, n = 14). Pupae that developed from planidia placed on 5th and 6th instars weighed 128.3 ± 7.4 mg (n = 12) and 125.6 ± 3.4 mg (n = 9), respectively. These values are significantly ($P < 0.01$) greater than an average weight of 104.8 ± 3.7 mg (n = 18) for pupae from planidia placed on 4th instars.

Female flies lived 18.1 ± 1.7 (n = 17) days while males lived 13.1 ± 1.5 (n = 19) days (sig. diff., $P < 0.05$). These females began to larviposit 8–13 days after eclosion. Of 133 planidia deposited during a 24 hr period, 85.7%, 64.7%, 25.6%, and 2.3% were alive 1, 2, 3, and 4 days after deposition, respectively.

All developmental tests were conducted at 27 ± 1°C and 60 ± 10% RH with a 16 hr photoperiod.

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Footnotes

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